The Bureau of Land Management is responsible for the stewardship of our public lands. It is committed to manage, protect, and improve these lands in a manner to serve the needs of the American people for all times. Management is based upon the principles of multiple use and sustained yield of our nation's resources within a framework of environmental responsibility and scientific technology. These resources include recreation; rangelands; timber; minerals; watershed; fish and wildlife; wilderness; air; and scenic, scientific, and cultural values.

The Department of Environmental Quality's mission is to protect, sustain, and improve a clean and healthful environment to benefit present and future generations.

Cover Photos: Top left photo shows the L87/91 leach pads at the Landusky Mine as of July 2000. Top right photo shows interim reclamation grading along the east edge of the L91 leach pad as of October 2001. Bottom photos show the lower leach pads (L79-L84) at the Landusky Mine in the fall of 1999 (left); and after interim reclamation in the summer of 2001 (right). The view is toward the northwest with Mission Peak appearing in the background of the bottom photos. Photos courtesy of Tom Weitz.

State of Montana Department of Environmental Quality

1520 East 6th Avenue P.O. Box 200901 Helena, Montana 59620-0901 (406) 444-2544 U.S. Department of the Interior Bureau of Land Management

Malta Field Office HC 65 Box 5000 Malta, Montana 59538 (406) 654-1240

December 2001

Dear Reader,

Enclosed is the Final Supplemental Environmental Impact Statement (SEIS) on reclamation of the Zortman and Landusky Mines in northcentral Montana. This EIS is a final supplement to the March 1996 Final EIS, *Zortman and Landusky Mines Reclamation Plan Modifications and Mine Life Extensions*. With the bankruptcy of the mines' operator, Zortman Mining, Inc., the Department of Environmental Quality and the Bureau of Land Management are overseeing reclamation at the mines. The Final SEIS has been prepared to analyze additional reclamation alternatives developed by the agencies that may constitute a substantial change from those presented in the 1996 Final EIS.

About 150 copies of the Draft SEIS were distributed to the public and other state and federal agencies in May for a 90-day comment period. During the public comment period the agencies held three public meetings in communities near the mines to collect comments. In addition to oral comments, 53 written comments were received on the Draft SEIS and Montana Pollution Discharge Elimination System (MPDES) permits. All comments, written and oral, were reviewed and considered in preparation of the Final SEIS. Comments that presented new data, questioned facts or analyses, or raised questions or issues bearing upon the analysis are responded to in Chapter 6 of this Final SEIS.

The Final SEIS presents 12 reclamation plans, six for reclamation of the Zortman Mine and six for reclamation of the Landusky Mine. The reclamation plans were developed based upon public scoping comments and through consultation with the Fort Belknap government and the Environmental Protection Agency. The alternatives and associated environmental analyses have been modified slightly based upon public comment received on the Draft SEIS. Alternative Z6 is the DEQ and BLM preferred reclamation alternative for the Zortman Mine, and Alternative L4 is the preferred reclamation alternative for the Landusky Mine. These alternatives are estimated to cost approximately \$52.1 million, which is \$22.5 million more than is available under the reclamation bonds. Other alternatives that could be implemented within the available reclamation bond are also identified as "preferred," in the event funding to implement Alternatives Z6 and L4 is not forthcoming. Also, an additional \$11 million is needed to fund long-term water treatment needs regardless of which reclamation alternative is selected.

The identification of the preferred alternatives does not constitute an agency decision but is intended to help the public focus on the alternatives likely to be selected. A Record of Decision that selects the alternatives for implementation will be prepared no sooner than 30 days after the availability of the Final SEIS is published in the Federal Register. A copy of the Record of Decision will be provided to everyone on the Final SEIS mailing list.

The agencies wish to thank all those who provided suggestions and comments on the Draft SEIS. Additional copies of the Final SEIS are available upon request from the Department of Environmental Quality or the Bureau of Land Management. The Final SEIS will be available on the agencies' website at: www.mt.blm.gov.

_/s/ Jan Sensibaugh	/s/ Bruce W. Reed
Jan Sensibaugh, Director	Bruce W. Reed, Field Manager
State of Montana	Bureau of Land Management
Department of Environmental Quality	Malta Field Office

Final Supplemental Environmental Impact Statement

Reclamation of the Zortman and Landusky Mines Phillips County, Montana

December 2001

Lead Agencies: United States Department of the Interior, Bureau of Land Management, Malta Field Office and State of Montana, Department of Environmental Quality, Environmental Management Bureau.

Cooperating Agencies: None.

Participating Agencies/Governments: United States Environmental Protection Agency and the Fort Belknap Indian Community Council.

Contacts for Further Information: Scott Haight, Bureau of Land Management, Lewistown Field Office, P.O. Box 1160, Lewistown, MT 59457 (406/538-1930) and Wayne Jepson, Montana Department of Environmental Quality, Environmental Management Bureau, P.O. Box 200901, Helena, MT 59620 (406/444-0529).

Abstract: This Final Supplemental EIS is a supplement to the 1996 Final EIS on Reclamation Plan Modifications and Mine Life Extensions at the Zortman and Landusky Mines. Since 1996, the mines' operator has declared bankruptcy and the regulatory agencies (DEQ and BLM) are overseeing reclamation using the reclamation bonds. Reclamation issues include the amount of pit backfilling, the type of reclamation covers to place over acid generating materials, protection of water quality, disposal of heap effluent, and long-term water treatment. The Fort Belknap Indian Reservation is adjacent the mining area and reclamation plans include measures to protect trust resources. The Final SEIS evaluates 12 reclamation alternatives, six for the Zortman Mine and six for the Landusky Mine. These include alternatives that could be implemented using the available reclamation bond and those that would require a considerable amount of additional funding. The alternatives were developed because they are either more cost effective, better address some environmental concerns, or both, than those presented in the 1996 FEIS. The preferred reclamation alternatives in the Final SEIS (Alternatives Z6 and L4) are estimated to cost \$52.1 million, which is approximately \$22.5 million more than is available under the reclamation bonds.

Other Environmental Review: This Final Supplemental EIS also serves as the environmental review document for the Montana Pollutant Discharge Elimination System (MPDES) permits to be issued by the Montana DEQ. The MPDES permits are in Appendix C.

Decision: A Record of Decision (ROD) that selects the alternatives for implementation will be issued no sooner than 30 days from the date the Notice of Availability for this Final EIS is published by EPA in the Federal Register. The ROD will include an explanation of the reasons for the decision and will be sent to everyone on the mailing list.

TABLE OF CONTENTS

Chan	ter 1: Introduction, Purpose of and Need for Action	<u>Page</u>
Спар	· •	
1.1	Introduction	
1.2	Project Location and History	
	1.2.1 Reclamation Plan Development History	
1.3	Purpose of and Need for Action	
1.4	Regulatory Authority, Roles, and Responsibilities	
	1.4.1 Montana Department of Environmental Quality	
	1.4.2 Bureau of Land Management	
	1.4.3 Participating/Coordinating Agencies	
1.5	Issues and Concerns	
	1.5.1 Scoping	
	1.5.2 Issues and Concerns Identified	
	1.5.3 Issues and Concerns Not Addressed	1-14
Chap	ter 2: Alternatives Development and Description	
2.1	Significant Issues and Alternatives	2-1
2.2	Development of the Alternatives	
2.3	Alternatives Eliminated from Detailed Analysis	
2.4	Description of the Alternatives	
	2.4.1 Reclamation Common to All Alternatives	
	2.4.2 Zortman Mine Reclamation Alternatives	
	2.4.3 Landusky Mine Reclamation Alternatives	
2.5	Cumulative Actions	
2.6	Preferred Alternative Identification	
	2.6.1 Preferred Alternatives	
	2.6.2 Implementation and Additional Preferred Alternatives	
2.7	Alternative Comparison Tables	
2.8	Impact Summary Comparison Tables	2-151
Chap	ter 3: Existing Conditions	
3.1	Study Area	3-1
3.2	Geology and Geotechnical Conditions	
	3.2.1 Geology and Topography	
	3.2.2 Geotechnical Conditions	
3.3	Water Resources and Geochemistry	
	3.3.1 Description of Supplemental Studies and Information	3-11
	3.3.2 Geochemistry/Acid Rock Drainage	

	3.3.3 Hydrology	3-20
	3.3.4 Water Balance and Chemical Mass Loading	
	3.3.5 Water Quality Classification System	
	3.3.6 Zortman Mine Drainage Basin Hydrology	
	3.3.7 Landusky Mine Drainage Basin Hydrology	
	3.3.8 Madison Group Aquifer	
	3.3.9 Beneficial Use	
	3.3.10 Regulatory Criteria	3-103
	3.3.11 Summary of Findings	3-105
3.4	Soil and Reclamation Materials	
	3.4.1 General Soil Description	3-108
	3.4.2 Soil Reclamation Potential	3-113
3.5	Vegetation	3-119
	3.5.1 General Vegetation Patterns	3-119
	3.5.2 Metal Concentrations in Plant Tissues	
3.6	Wildlife and Aquatics	3-124
	3.6.1 Wildlife Resources	3-124
	3.6.2 Aquatic Resources	3-125
3.7	Air Quality and Meteorology	
	3.7.1 Air Quality	
	3.7.2 Climate and Meteorology	
3.8	Land Use	3-130
3.9	Recreation and Visual Resources	3-132
	3.9.1 Recreation Resources	
	3.9.2 Visual Resources	3-132
3.10	Cultural Resources	3-135
	3.10.1 American Indian Cultural Resources	3-135
	3.10.2 History	3-139
3.11	Social and Economic Conditions	
	3.11.1 Social Conditions	3-141
	3.11.2 Economic Conditions	3-143
3.12	Reclamation and Bonding Status	3-148
	3.12.1 Overall Site Management	3-149
	3.12.2 Seepage Capture and Treatment	
	3.12.3 Leach Pad Solution Management	
	3.12.4 Interim Surface Reclamation	
	3.12.5 Final Reclamation Plan Development Costs	
	3.12.6 Restrictions on the Use of Existing Reclamation Bonds	
	3.12.7 Bond Restrictions and Their Potential Influence on Reclamation	3-151

Chapter 4: Environmental Consequences

4.1	Impact Methodology	4-1
	4.1.1 Assumptions	
	4.1.2 Multiple Accounts Analysis Methodology	4-2
4.2	Geology and Topography	
	4.2.1 Economic Geology	
	4.2.2 Geotechnical Stability	4-5
	4.2.3 Topography	
4.3	Water Resources and Geochemistry	4-11
	4.3.1 Methodology	
	4.3.2 Impacts Common to All Alternatives	
	4.3.3 Zortman Mine	
	4.3.4 Landusky Mine	4-39
	4.3.5 Goslin Flats LAD Area	
	4.3.6 Zortman and Landusky Town Water Supplies	
	4.3.7 Madison Group Aquifer	
	4.3.8 Reasonably Foreseeable Significant Adverse Impacts	
4.4	Soils and Reclamation	
	4.4.1 Impacts Common to All Alternatives	
	4.4.2 Zortman Mine	
	4.4.3 Landusky Mine	
4.5	Vegetation and Revegetation	
	4.5.1 Impacts Common to All Alternatives	
	4.5.2 Zortman Mine	
	4.5.3 Landusky Mine	4–75
4.6	Wildlife and Aquatics	4-77
	4.6.1 Impacts Common to All Alternatives	
	4.6.2 Zortman Mine	
	4.6.3 Landusky Mine	4-85
4.7	Air Quality	
	4.7.1 Methodology	
	4.7.2 Zortman Mine	
	4.7.3 Landusky Mine	4-95
4.8	Land Use	4-97
4.9	Recreation and Visual Resources	4-98
	4.9.1 Impacts Common to All Alternatives	4-98
	4.9.2 Zortman Mine	
	4.9.3 Landusky Mine	4-104
4.10	Cultural Resources	
	4.10.1 Impacts Common to All Alternatives	4-108
	4.10.2 Zortman Mine	
	4.10.3 Landusky Mine	4-110
	1.10.5 Landasky Willie	

4.11	Social and Economic Conditions	4-112
	4.11.1 Impacts to Social Conditions	4-112
	4.11.2 Impacts to Economic Conditions	4-115
4.12	Reclamation and Water Treatment Bonds	4-131
	4.12.1 Zortman Mine	4-136
	4.12.2 Landusky Mine	4-137
	4.12.3 Water Treatment Bonds and Options	
4.13	Comparison of the Alternatives	
	4.13.1 Alternative Comparison Methods	
	4.13.2 Zortman Mine Alternatives Comparison	
	4.13.3 Landusky Mine Alternatives Comparison	
Chap	ter 5: Consultation and Coordination	
-		
5.1	Public Involvement	
5.2	Consultation with the Fort Belknap Government	
5.3	Distribution List	
5.4	List of Preparers	
5.5	Technical Working Group Members	. 5-16
Chap	ter 6: Comments and Responses	
See C	hapter 6 Table of Contents	6-1
Refer	ences	R-1
Gloss	ary of Terms	. G-1
Subje	ect Index	I-1
Appe	ndices	
A	Multiple Accounts Analysis Spreadsheets	. A-1
В	Reclamation Cover Performance Modeling	
C	MPDES Permits	
D	Economic Impacts	

Figures

1.2-1	General Location Map	1-2
1.2-2	Detailed Location and Ownership Map	
2.4-1	Zortman Mine Reclamation Covers, Alternatives Z1-Z6	2-17
2.4-2	Landusky Mine Reclamation Covers, Alternatives L1-L6	
2.4-3	Map of Zortman Mine Alternative Z1	
2.4-4	Map of Zortman Mine Alternative Z2	
2.4-5	Map of Zortman Mine Alternative Z3	
2.4-6	Map of Zortman Mine Alternative Z4	
2.4-7	Map of Zortman Mine Alternative Z5	
2.4-8	Map of Zortman Mine Alternative Z6	2-63
2.4-9	Map of Landusky Mine Alternative L1	2-77
2.4-10	Map of Landusky Mine Alternative L2	
2.4-11	Map of Landusky Mine Alternative L3	2-97
2.4-12	Map of Landusky Mine Alternative L4	2-105
2.4-13	Map of Landusky Mine Alternative L5	2-113
2.4-14	Map of Landusky Mine Alternative L6	2-123
2.8-1	MAA Scores versus Reclamation Cost for the Zortman Mine Alternatives	
2.8-2	MAA Scores versus Reclamation Cost for the Landusky Mine Alternatives .	2-176
3.3-1	Paste pH vs Total Sulfur	3-16
3.3-2	Neutralization Potential vs Acid Potential	3-17
3.3-3	Paste pH vs Net Acid Potential	3-18
3.3-4	Zortman Mine Drainage Areas	3-24
3.3-5	Landusky Mine Drainage Areas	3-25
3.3-6	Zortman Mine Ruby Shear Zone and Underground Workings	3-31
3.3-7	Landusky Mine Shear Zones and Underground Workings	3-32
3.3-8	Zortman Mine Water Table Contours, November 1999	3-34
3.3-9	Zortman Mine Water Table Contours, November 2000	3-35
3.3-10	Landusky Mine Water Table Contours, October 1999	3-36
3.3-11	Landusky Mine Water Table Contours, October 2000	3-37
3.3-12	Sources and Fate of Zortman Mine Annual Sulfate Loads	3-50
3.3-13	Sources and Fate of Zortman Mine Annual Total Metal Loads	3-51
3.3-14	Sources and Fate of Landusky Mine Annual Sulfate Loads	3-52
3.3-15	Sources and Fate of Landusky Mine Annual Total Metal Loads	3-53
3.3-16	Zortman Mine Water Classification System	3-59
3.3-17	Landusky Mine Water Classification System	3-60
3.3-18	Goslin Gulch Water Classification System	3-61
3.3-19a	Zortman Mine Monitoring Sites (Groundwater)	3-64
3.3-19b	Zortman Mine Monitoring Sites (Surface Water)	
3.3-20	pH Trends Below Zortman Mine	
3.3-21	Sulfate Trends Below Zortman Mine	
3.3-22	Goslin Gulch LAD Monitoring Sites	3-73

3.3-23a	Landusky Mine Monitoring Sites (Groundwater)	. 3-79
3.3-23b	Landusky Mine Monitoring Sites (Surface Water)	3-80
3.3-24	pH Trends Below Landusky Mine	3-82
3.3-25	Sulfate Trends Below Landusky Mine	3-83
3.3-26	Gaining, Losing, and Stable Reaches of Mine Site Drainages	3-97
4.3-1	Schematic of pH Over Time in ARD Impacted Waters	4-22
4.3-2	Schematic of Sulfate Concentration Over Time in ARD Impacted Waters	4-22
4.13-1	MAA Scores for Various Analyses for the Zortman Mine	4-145
4.13-2	Four Main Account Scores for the Technical Working Group Consensus	
	Analyses for the Zortman Mine	4-146
4.13-3	MAA Scores versus Reclamation Cost for the Zortman Mine Alternatives	4-147
4.13-4	MAA Scores for Various Analyses for the Landusky Mine	4-149
4.13-5	Four Main Account Scores for the Technical Working Group Consensus	
	Analyses for the Landusky Mine	4-150
4.13-6	MAA Scores versus Reclamation Cost for the Landusky Mine Alternatives	4-151
	• • • • • • • • • • • • • • • • • • •	

TABLES

2.6-1	Comparison of Alternatives L4 and L5	. 2-130
2.7-1	Zortman Mine Reclamation Alternatives Comparison	. 2-135
2.7-2	Landusky Mine Reclamation Alternatives Comparison	. 2-143
2.8-1	Summary of Environmental Impacts, Zortman Mine Reclamation	. 2-152
2.8-2	Summary of Environmental Impacts, Landusky Mine Reclamation	. 2-165
3.3-1	Water Quality Classification System for Zortman and Landusky Mines	3-57
3.3-2	Current Water Quality Conditions and Trends in Zortman Drainage Basins	3-77
3.3-3	Current Water Quality Conditions and Trends in Landusky Drainage Basins .	3-95
3.4-1	Fertility, Organic Matter Content, and pH of the Uppermost Mineral Horizon	
	of Four Reference Soils near Mine Reclamation	. 3-109
3.4-2	Physical Properties of Reference Soils	
3.4-3	Microbiological Properties of Reference Soils	
3.4-4	Soil Types in the Goslin Flats LAD Area	. 3-111
3.4-5	Soil Salinity and Sodium Hazard Calculations at Goslin Flats LAD	. 3-113
3.4-6	Particle Size and Texture of Two Soil Stockpiles	
3.4-7	Soil Stockpile Fertility and Organic Matter Content	. 3-115
3.4-8	Microbiological Properties of Two Soil Stockpiles	
3.4-9	Two Methods of Textural Analysis of the King Creek Alluvium/Tailings	
3.4-10	Two Methods of Texture Analysis of the Ruby Gulch Tailings	
3.11-1	Average Annual Employment by Industry for Phillips & Blaine Counties-1999	
3.11-2	Estimated Total Economic Impact to Study Area for Year 2000 Interim	
	Reclamation	. 3-147
3.12-1	Reclamation Bond/Funds Summary	
4.3-1	Summary of Estimated Reclamation Cover Infiltration by Alternative	4-15
4.3-2	Load Estimates for Zortman Mine Reclamation Alternatives	
4.3-3	Load Estimates for Landusky Mine Reclamation Alternatives	4-17
4.3-4	Calculations of Potential Flows Downstream If Bypassing Capture	4-18
4.5-1	Vegetation Acreage for Zortman Mine Alternatives	
4.5-2	Vegetation Acreage for Landusky Mine Alternatives	4-75
4.7-1	Historical Air Quality Data	4-94
4.7-2	Zortman Mine - Projected Air Quality at Zortman Townsite	4-95
4.7-3	Landusky Mine - Projected Air Quality at Landusky Townsite	4-96
4.11-1	Impacts from Employment/Expenditures for Water Treatment Plant	
4.11-2	Alternative Z1 Estimated Total Economic Impact to Study Area	. 4-120
4.11-3	Alternative Z2 Estimated Total Economic Impact to Study Area	
4.11-4	Alternative Z3 Estimated Total Economic Impact to Study Area	
4.11-5	Alternative Z4 Estimated Total Economic Impact to Study Area	
4.11-6	Alternative Z5 Estimated Total Economic Impact to Study Area	
4.11-7	Alternative Z6 Estimated Total Economic Impact to Study Area	

4.11-8	Alternative L1 Estimated Total Economic Impact to Study Area 4-12:
4.11-9	Alternative L2 Estimated Total Economic Impact to Study Area 4-12
4.11-10	Alternative L3 Estimated Total Economic Impact to Study Area 4-12
4.11-11	Alternative L4 Estimated Total Economic Impact to Study Area 4-12
4.11-12	Alternative L5 Estimated Total Economic Impact to Study Area 4-12
4.11-13	Alternative L6 Estimated Total Economic Impact to Study Area 4-130
4.12-1	Zortman Mine Reclamation Cost by Alternative
4.12-2	Landusky Mine Reclamation Cost by Alternative